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STATUS REPORT FOR
DESCURAINIA TORULOSA (WYOMING TANSYMUSTARD),
SWEETWATER COUNTY, WYOMING

Prepared for the Bureau of Land Management, Rock Springs District
by:

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INTRODUCTION

Descurainia torulosa, the Wyoming tansymustard (occasionally called the mountain or torulose tansymustard), is a Category 1 candidate for Federal listing as Threatened or Endangered (US Fish and Wildlife Service 1990). It is designated Sensitive in Region 4 of the US Forest Service (USDA Forest Service 1989a and 1989b), and has been recommended for Sensitive designation in Region 2. It is being managed as a Sensitive species by the Rock Springs District of the Bureau of Land Management (BLM) (Weynand and Amidon 1991). Prior to 1991, the tansymustard was known from only seven recently-documented populations, all in Wyoming. Six of these occur in the Absaroka Mountains of northwest Wyoming, on land managed by Bridger-Teton and Shoshone National Forests (Marriott 1991). The seventh is widely-disjunct from the main range of the species, and is located in Sweetwater Co., WY, southeast of Rock Springs. It has been suggested that this disjunct population is a separate taxon (Dorn 1989), but too little material has been available for adequate assessment of taxonomic status.

In 1991, the Rock Springs District of the BLM contracted on a cost-share basis with the Wyoming Natural Diversity Database (WYNDD) of The Nature Conservancy to carry out field surveys of the Wyoming tansymustard in the area of the disjunct population in Sweetwater Co. (Figure 1), and to establish a monitoring program to track population trends. This report presents the results of the study, as well as other information on the status, biology and management needs of Descurainia torulosa.

METHODS

The project consisted of three parts: 1) survey to determine distribution, abundance, habitat and threats for Descurainia torulosa; 2) limited taxonomic study to better understand the relationship between D. torulosa and other members of the genus; and 3) establishment of a monitoring program (including collecting baseline data) to track population trends for Wyoming tansymustard populations found on lands managed by the BLM.

Survey

Information for known Descurainia torulosa sites was obtained from secondary sources, including WYNDD manual and computer files, and the Rocky Mountain Herbarium at the University of Wyoming in Laramie, the literature, and knowledgeable individuals. The principal investigator (H. Marriott) had visited the single known population from the study area in 1987, and both investigators (Marriott and A. Flinck) worked on surveys of the tansymustard in the Absaroka Mountains in 1990 (Marriott 1991), and so were familiar with the target species and its habitat.

Survey began with aerial reconnaissance by small plane to locate potential habitat within the study area. These sites were

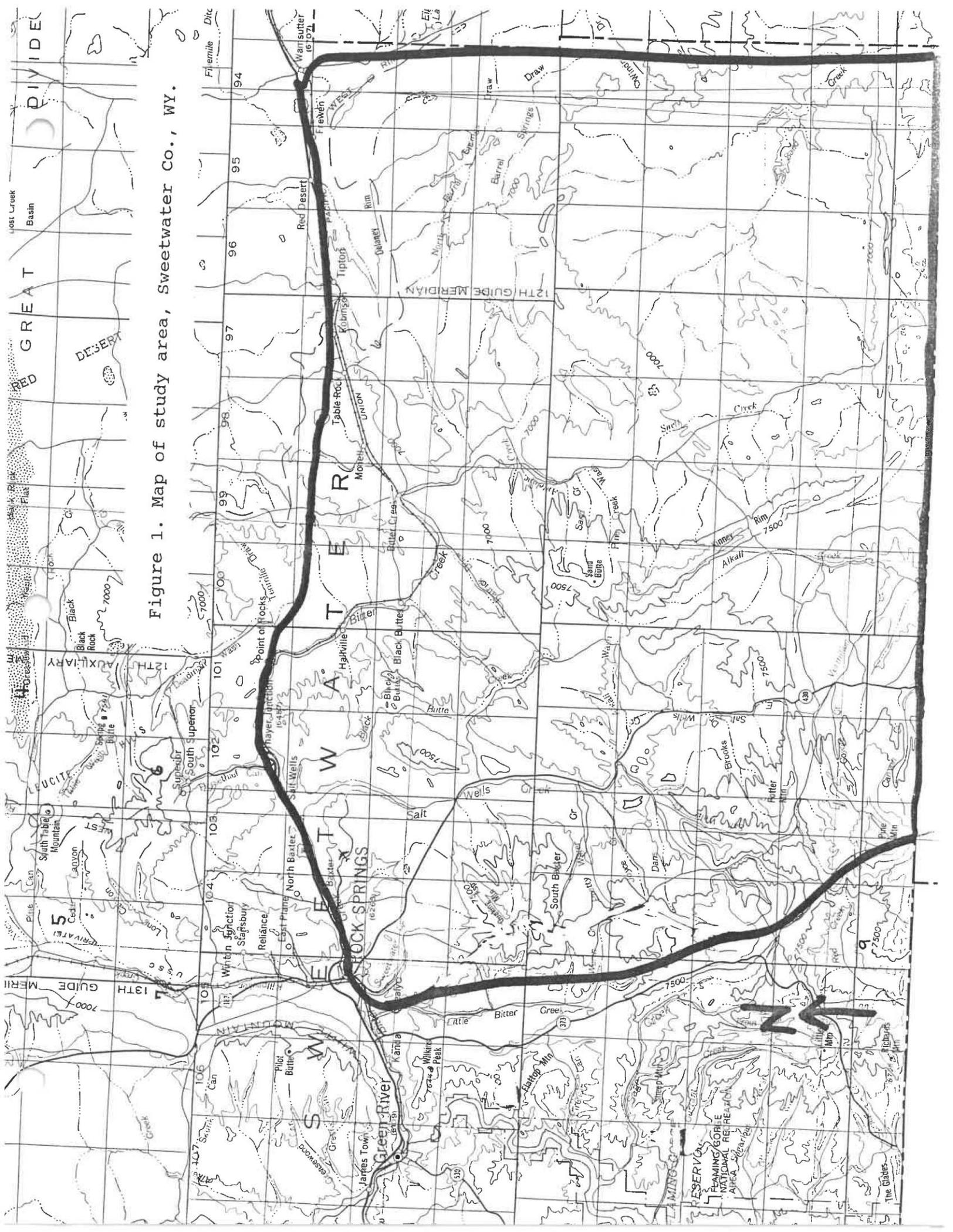


Figure 1. Map of study area, Sweetwater Co., WY.

then surveyed on foot (search routes are shown in Appendix A). On-the-ground survey took place from July 19 through 24. Information on biology and management needs was collected using a standard field form of The Nature Conservancy (Appendix B).

Taxonomic Studies

Taxonomic study of Descurainia torulosa has been hampered by inadequate material. The species was described based on a single specimen (Rollins 1983). Dorn (1989) did not examine previous collections, which were on loan to the New York Botanical Garden at the time, and did not address taxonomic problems. In the fall of 1990, specimens were returned from New York to the Rocky Mountain Herbarium, University of Wyoming. In addition, limited material was collected by Marriott and Flinck in the Absaroka Mountains in 1990, and morphological analysis of all known specimens (nine total) was carried out the following winter (Marriott 1991). The conclusions of that study are summarized in RESULTS below. In 1991, additional material was collected from the single new population discovered in the course of this study, and was compared with existing specimens of Descurainia torulosa.

In 1990, seeds were collected from two of the Absaroka populations for greenhouse propagation, in hopes of providing more material for taxonomic study. Propagation was attempted at the University of Wyoming, Department of Botany Greenhouse during the following winter. After cold storage for several months, seeds were placed in petri dishes on damp filter paper. Germination was attempted under both light and dark conditions, without success. In October, 1991, another attempt using the same material was more successful, but the few seedlings produced subsequently died.

Monitoring

Based on population size and within-site distribution of individuals, a complete census was chosen as the method for monitoring population trends. Descurainia torulosa plants are very unevenly distributed at the sites. They generally occur as small to large groups of plants (5-400) separated by relatively-large stretches of unoccupied habitat. Because of extremely uneven distribution and small population size, sampling would have to be intensive to accurately track population trends.

The Wyoming tansymustard lends itself well to simple censusing. Population sizes are small, and even in the larger groups, individual plants are distinct and easily counted. The only difficulty encountered in censusing was walking along the cliff bases in some areas of rock and steep loose scree. However, access to potential habitat was not impossible, just slow. Between four and five person hours were required for counting plants at each of the two sites.

Results of the census are presented under **Abundance and Population Trends** in RESULTS below.

RESULTS

Description (See Figures 2 and 3, and slides in Appendix D)

Technical description. Occasionally-annual (?), biennial or short-lived perennial, stellate-hairy throughout; stems single to several to many, procumbent (or erect?), to 13 (22?) mm long, arising from dense cluster of stem leaves, which may be lost with age; basal leaves pinnately compound, 2-3 cm long, primary lobes simple or with 1 or 2 subsidiary lobes; cauline leaves few, similar to basal leaves; flowers minute, petals slightly more than 1 mm long, yellow; fruiting pedicels erect, or more commonly ascending, to 3.0 (3.5) mm long; siliques erect, occasionally appressed to rachis or more commonly ascending, arcuate to nearly straight, terete, linear, torulose, tapered below and toward apex, 8-15 mm long, slightly more than 1 mm in diameter, stellate pubescent (sometimes sparsely so or glabrous); style slender, ca. 0.2 mm long, usually pubescent; seeds in a single row, narrowly oblong, plump, ca. 1.3 mm long, wingless, ca. 0.5 mm in diameter, dark brown (modified from Rollins 1983, Dorn 1989).

Characters useful in field identification. In Sweetwater Co., Descurainia torulosa appears to be annual or biennial (in the Absaroka Mountains, some populations include what appear to be short-lived perennials); stellate pubescent (fine divided hairs) throughout giving the herbage a dull-green to gray-green appearance; stems single (mostly single in Sweetwater Co. populations) to several to many from a cluster of basal leaves, generally less than 15 cm long, spreading and often downcurved at base; leaves pinnately divided, concentrated near base of plant; stem leaves few, similar to basal leaves; flowers many per stem, minute, yellow; fruit linear, to 15 mm long, stellate pubescent, though sometimes sparsely so (glabrous at Pine Butte in Sweetwater Co.), on short stems (pedicels) mostly less than 3 mm long; fruit are constricted slightly between seeds (torulose), and often curved. Fruit are required for identification.

Flowering/fruiting Season

All visits to Descurainia torulosa sites in Sweetwater Co., from the original discovery in 1980 through this project's surveys, were made between July 20 and 22. Plants in flower and fruit were seen, as well as basal rosettes (may be D. incana). Fruit are required for identification. The fruiting season probably extends from early July through mid-August, and may be even longer. D. torulosa has been assumed to be biennial, but no studies have been done to document this. The tansymustard appears to be a short-lived perennial under appropriate conditions (relatively robust, multi-stemmed individuals have been found in the Absarokas), and may flower and fruit as first-year plants on occasion (Marriott 1991).

Figure 2. *Descurainia torulosa* line drawing (USDA Forest Service 1989b).

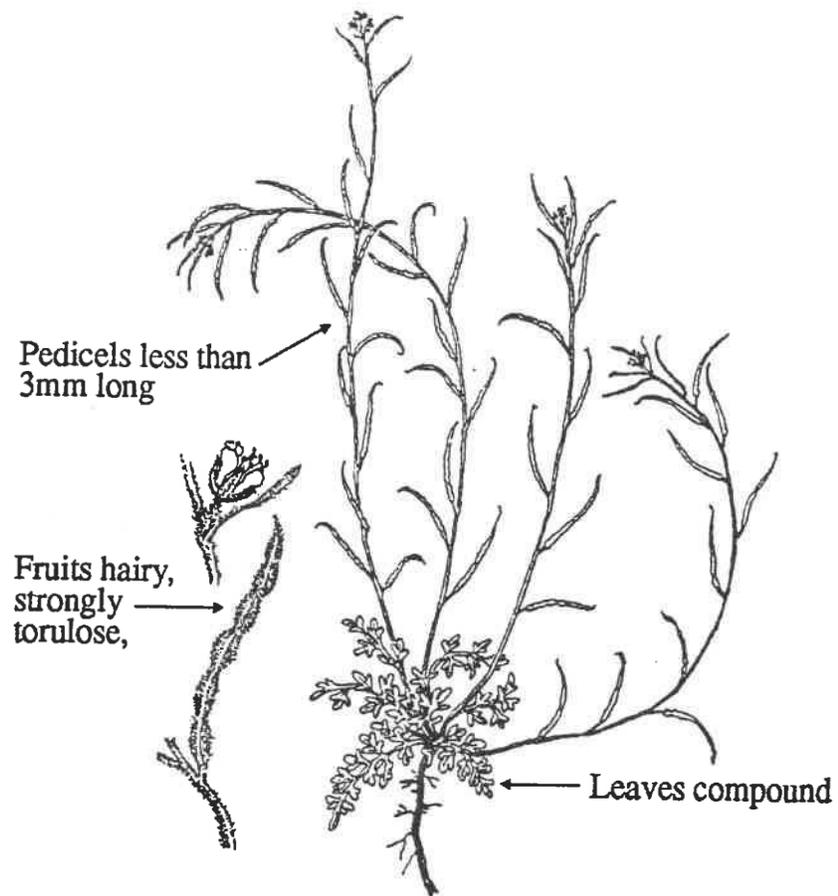




Figure 3. Photograph of Descurainia torulosa showing torulose siliques (A. Flinck photo).

Distribution

Prior to this study, Descurainia torulosa had been reported from eight locations (seven recently verified), all in Wyoming: three in the Absaroka Mountains of Park and Fremont Counties, and one in the high desert southeast of Rock Springs in Sweetwater County. However, during a status survey for the US Fish and Wildlife Service, Dorn (1989) failed to relocate one of the Absaroka populations, finding only the related species, D. incana, which was mixed with the original collection. Dorn also suggested that the population in Sweetwater County was probably a separate taxon.

Field survey in 1991 yielded one new population of the tansymustard. There are now two populations known from Sweetwater Co., at Pine Butte at the north end of Kinney Rim, and at Lion Bluffs at the northeast end of Quaking Asp Mountain. A global distribution map for Descurainia torulosa is included as Figure 4. Element occurrence records (formatted database reports) and maps for populations within the study area are contained in Appendix C. **Although these printouts may appear "unfriendly," they contain the most detailed, site-specific information available, and should be read.**

Abundance (Population Size)

The two Descurainia torulosa populations surveyed during this project are small. The Pine Butte population contained 137 individuals in flower/fruit scattered along 0.5 mile of cliff base; the Lion Bluffs population contained 890 plants clustered into several groups along 0.4 mile of cliff base. Although they are small, these populations are much larger than the those surveyed in the Absaroka Mountains in 1990; Absaroka populations ranged from 19 to 65 plants (Marriott 1991). At Pine Butte, numerous basal rosettes were seen in addition to plants in flower and fruit, but D. torulosa rosettes cannot be distinguished from those of D. incana, which also occurs at the site. Population data are included in the element occurrence records in Appendix C.

Population trends. Population trend data for Descurainia torulosa is available for the Pine Butte site. Population size appears to have fluctuated widely since 1987. In her site visit in 1987, Marriott estimated that there were 100-150 plants in flower/fruit present (WYNDD files). Dorn (1989) reported only nine plants within two square meters; half were rosettes, and therefore may have been D. incana. In 1991, the population was back up to 1987 levels (137 plants in flower/fruit).

The wide fluctuations in population size suggest that the Wyoming tansymustard may be especially sensitive to year-to-year fluctuations in environmental factors such as precipitation and temperature. The tansymustard appears to require relatively cool moist habitat; it occurs in what are very mesic microsites for the

Figure 4. *Descurainia torulosa* global distribution map. Question mark indicates a population in Park County that was not relocated in 1989.



area (see discussion of habitat below). It may be that in years of low moisture and high temperatures, germination and/or survivorship are low.

Habitat

Descurainia torulosa has been reported to occur on rocky slopes at the base of cliffs (Rollins 1983), and at the base of cliffs, usually north-facing, and often under an overhang (Dorn 1989). The Pine Butte population in Sweetwater Co. was thought to be unusual in that it occurred in association with sandstone rather than volcanic rock, as in the main range of the species. However, the 1990 survey resulted in a somewhat different definition of habitat (Marriott 1991). In the southern Absaroka Mountains, D. torulosa occurs specifically on a sandy soil at the base of cliffs composed of the Tertiary volcanic Wiggins Formation (Love and Christiansen 1985). These cliffs are composed mainly of a volcanic breccia made up of large clasts, with occasional sandy strata. Populations occur where a sandy stratum is found at the cliff base, producing a sandy soil at the foot of the cliff (top of scree slope) or on low ledges. Aspect ranges from southwest to south to east to north. The tansymustard may also occur on inaccessible ledges near sandy strata higher on the cliffs.

In Sweetwater Co., the Wyoming tansymustard occurs also at the bases of cliffs (Figures 5 and 6), but the cliffs are composed of sandstone rather than volcanic breccia. Aspect is predominantly northerly (north to northwest). However, the microhabitat of the species appears similar in both areas--sparsely-vegetated sandy soil close to a cliff or outcrop base.

The most commonly associated species at Pine Butte are Arenaria nuttallii (a sandwort) and Cryptantha watsonii (a catseye). At Lion Bluffs, the Wyoming tansymustard grows with Chenopodium atrovirens (a goosefoot) and Cryptantha watsonii. Common associates in the southern Absaroka Mountains include Achillea millefolium (western yarrow), Erigeron compositus (cut-leaved daisy) and Oxyria digyna (mountain sorrel).

Descurainia torulosa has been found at elevations ranging from 8300 to 10,000 feet above sea level (asl). In Sweetwater Co., habitat ranges from 8300 to 8500 feet asl.

Slides of Descurainia torulosa and habitat in Sweetwater Co. are included in Appendix D.

Existing and Potential Threats

The Wyoming tansymustard appears to be very vulnerable to extinction. It is presently known from only seven small to very small populations. Habitat in the Absaroka Mountains is subject to frequent natural disturbance (rockfall and erosion in general); no man-caused threats were identified. However, there remain large areas of unsurveyed potential habitat in the Absarokas, and degree of endangerment remains unclear (Marriott 1991).

Figure 5. Photograph of Descurainia torulosa habitat, Pine Butte.

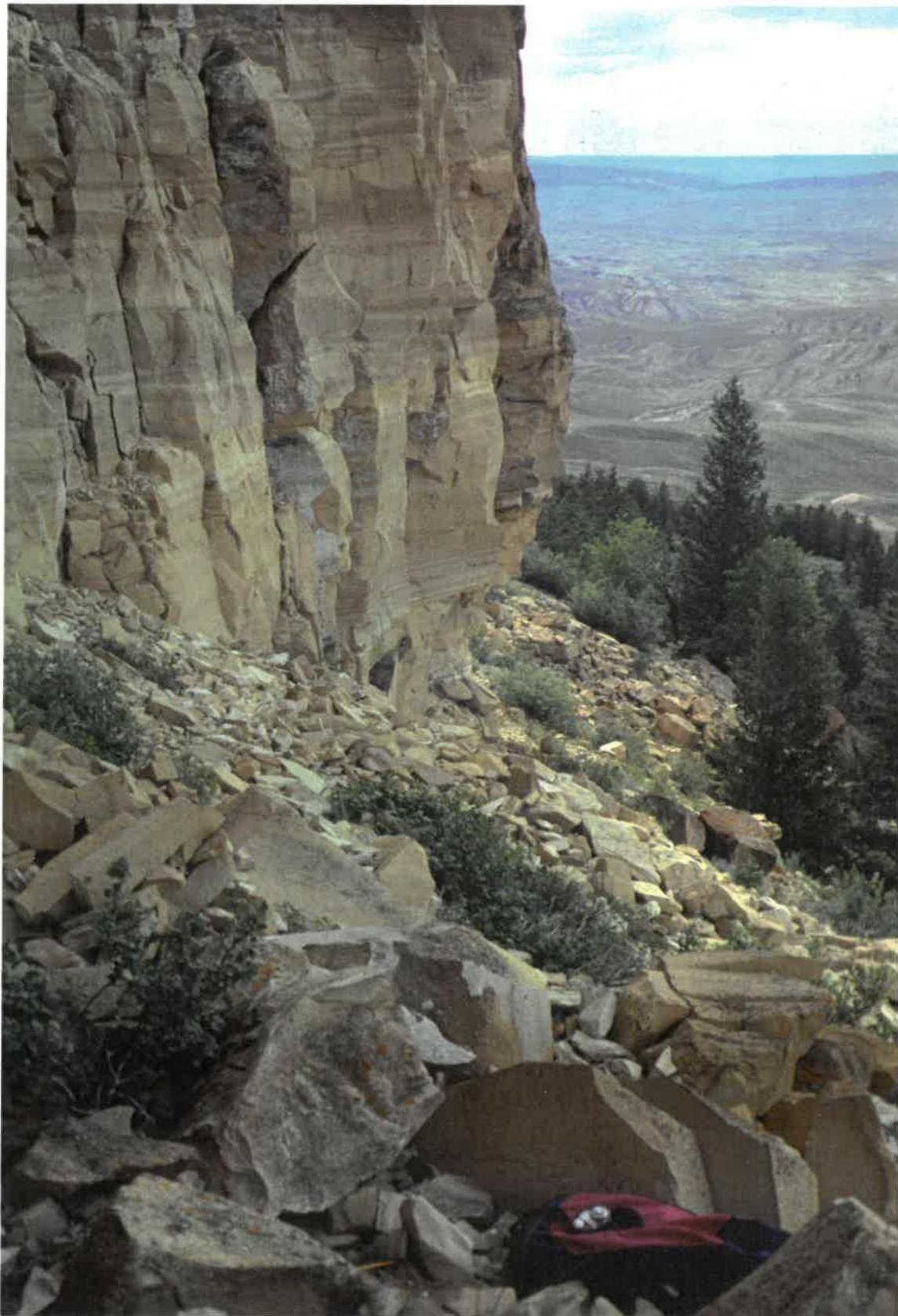
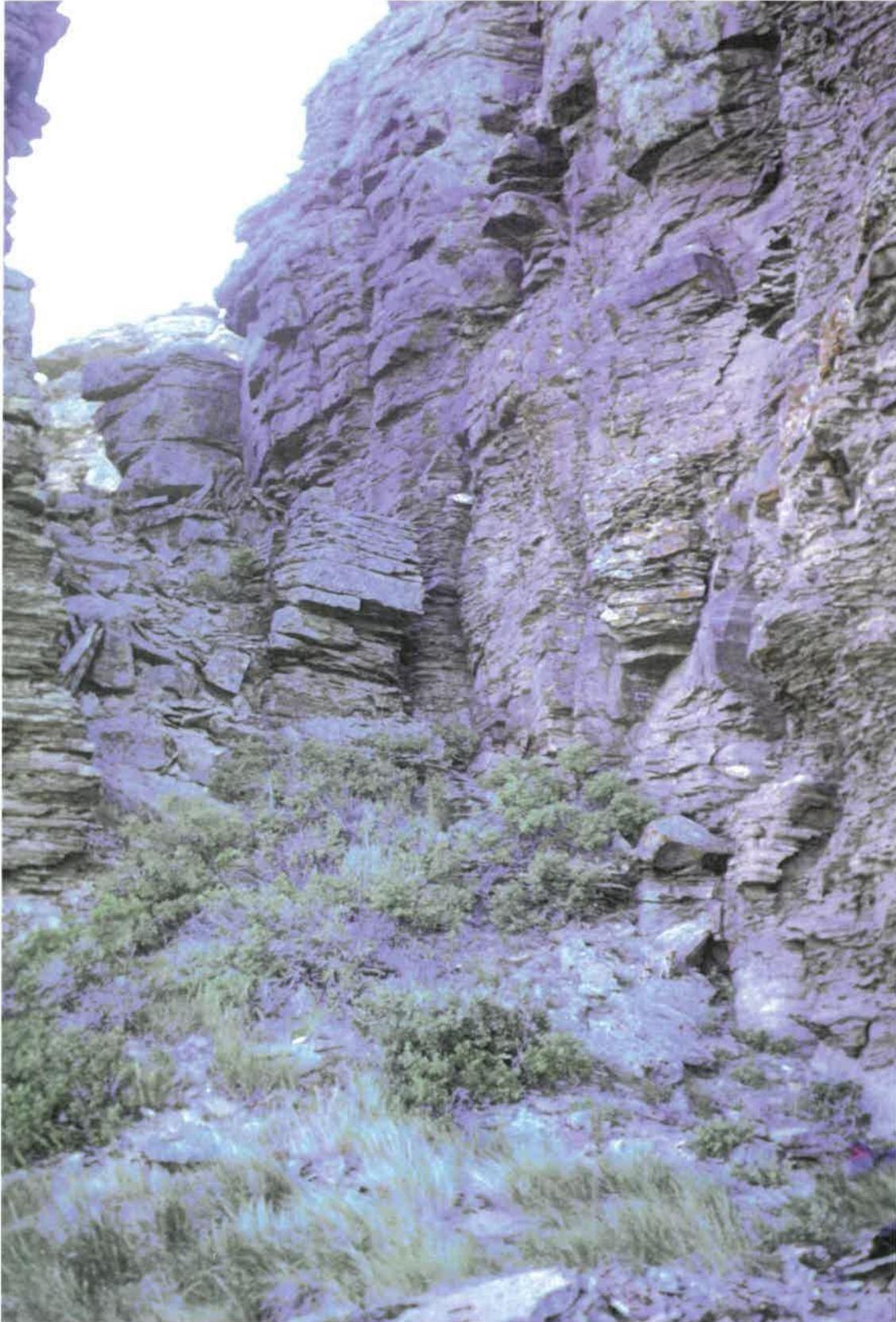


Figure 6. Photograph of Descurainia torulosa habitat, Lion Bluffs.



In Sweetwater Co., existing human-caused threats to Descurainia torulosa were identified only at Pine Butte. Debris thrown from the telecommunications facility on the summit has landed in areas of potential habitat along the cliff base.

Potential threats identified for the Lion Bluffs population are (major) expansion of the telecommunications facility at the southwest end of Quaking Asp Mountain, and increased use of the area for recreation. From the telecommunications facility, a two-track road runs northeast along the length of the ridgecrest to Lion Bluffs. The southwest end of the tansymustard population is easily accessible from this road, but human use of the immediate habitat is minor at present.

Natural rockfall and erosion appear to be significantly less threatening to Descurainia torulosa populations in Sweetwater Co. than in the Absaroka Mountains. At Pine Butte and Lion Bluffs, one does not have the constant feeling of impending rockfall, in contrast with Absaroka tansymustard sites.

Taxonomic Studies

Descurainia torulosa was first described by Reed Rollins (1983) based on a single specimen from the "Wind River Range, near Brooks Lake," collected in 1966 by Richard Scott, of Central Wyoming College in Riverton. This population was relocated by R. Dorn in 1989. Two additional locations were reported for the Absaroka Mountains further north, based on specimens collected by R. Kirkpatrick in 1984, and Erwin Evert in 1986 (Rocky Mountain Herbarium). One location has been reported for Sweetwater County based on a collection by Keith Dueholm (Rocky Mountain Herbarium). These specimens were examined by Reed Rollins of the New York Botanical Garden, an expert on the family Brassicaceae and the genus Descurainia, but Rollins assigned only tentative names to all but the type specimen (i.e. "Descurainia torulosa ?"). He concluded that more material was needed to clarify the situation.

Dorn (1989) briefly discussed the taxonomic problems surrounding the Wyoming tansymustard. He concluded that "widely separated distribution, the scarcity of plants along with at least one mixed collection, the extensive variability, the different substrates, and the general habitat (base of cliffs) matching that of Descurainia incana suggest that D. torulosa is just a variant of D. incana. Whether or not it is varietally significant is open to question." D. incana (synonymous with D. richardsonii) has been found in the vicinity of the Brooks Lake site, and was found at the reported Carter Mountain site by Dorn. It also occurs at the Pine Butte site in Sweetwater Co.

It is assumed that Dorn's conclusions are based on comments by Rollins, as Dorn was not able to study specimens directly, nor did he find suitable material in his field surveys (mainly basal rosettes). In any case, far too few specimens have been available in the past to make any kind of decision on taxonomy. Detling (1939), in his study of the genus Descurainia in North America, concluded that at least in North America, members of the genus "are

extremely variable, and attempts to identify isolated specimens frequently lead to confusing results." The Wyoming tansymustard appears to be no exception to his conclusions.

Two taxonomic questions concerning Descurainia torulosa have arisen in the past: 1) is full species status appropriate? and 2) should the Pine Butte population be considered a separate species? Nine specimens of Descurainia torulosa were examined following 1990 survey work in the Absaroka Mountains, including eight from the Absarokas and one from Sweetwater County (Marriott 1991). With the exception of the Sweetwater County material, all specimens shared the following fruit characters, which have been used to separate Descurainia torulosa from related taxa, including D. incana: siliques pubescent (sometimes sparsely so), torulose and often arcuate. All but one of the Absaroka specimens were multistemmed. The exception was collected on Carter Mountain, and appears to be annual (very slender taproot, no crown). This population was not relocated in 1989 (Dorn 1989). All but one of the Absaroka specimens had pedicels less than 3mm. The exception was collected in the North Fork Shoshone River drainage, and includes several unusually robust individuals. The Sweetwater County material was much less pubescent and robust than specimens from the Absarokas, and fruits were glabrous.

Following this analysis of morphology, it was concluded that the Absaroka populations are much more similar to each other than to any other species of Descurainia, including D. incana (Marriott 1991). The "extensive variability" reported by Dorn was not observed. Fruit of D. incana are not torulose, only slightly if at all arcuate, and generally glabrous. The one exception is D. incana var. viscosa, which has fruit that are occasionally glandular. The growth habit of the Wyoming tansymustard is particularly distinctive, specifically the concentration of leaves at the base, and the spreading, often-decumbent nature of the stems.

Additional material of Descurainia torulosa was collected in 1991 from the newly-discovered population at Lion Bluffs. This population is very interesting in that plants seem to bridge the gap between the Pine Butte material and specimens collected in the Absarokas. Dorn (1989) had suggested that the Pine Butte population might be a separate taxon, as fruits are glabrous. In the Lion Bluffs material, siliques are obviously pubescent; in fact they are visibly (to the naked eye) gray with fine hairs. Both Sweetwater Co. populations have the distinctive growth habit found in Absaroka material--spreading, often decumbent stems with leaves clustered near the base of the plant. However, no Sweetwater Co. plants were found that were as robust as many of the individuals seen in the Absarokas: all had single rather than multiple stems, and none appeared to be perennial.

It is likely that the Pine Butte population represents the extreme in range of pubescence observed in Descurainia torulosa, rather than a separate taxon. One population found in the Absarokas in 1990 had very sparsely pubescent siliques, while the others were visibly gray with stellate hairs.

Detling (1939) addressed the reliability of morphological characters in determinations in Descurainia. He found growth habit, pubescence (excluding glandulosity), general shape of siliques (linear vs. broader), orientation of pedicels and siliques, size of flowers, and flower color to be most useful. Of these characters, growth habit, and pedicel/fruit orientation are relevant in considering the taxonomic status of Descurainia torulosa. Pubescence seems to vary widely, although material from most of the known populations is obviously pubescent.

The role of environmental factors in determining growth habit is unknown. Detling (1939) found habit to be fairly consistent within species, including Descurainia incana (= D. richardsonii). In looking at available material, it appears that D. torulosa may occasionally flower and fruit the first year, producing single stemmed plants with slender taproots. Detling states that amount and distribution of pubescence can vary within certain limits based on shading and moisture, for example, but that the character is fixed genetically in most forms, as shown by experimental cultures. Pedicel and silique orientation was considered to be very reliable.

Based on the limited material available, it appears that Descurainia torulosa is a valid entity, and that Sweetwater Co. populations should not be recognized as taxonomically distinct. Whether species or varietal status is appropriate is not known. Dorn (1989) suggests inclusion under D. incana, but aside from co-occurrence, there is no clear reason for such treatment. In any case, additional specimens from throughout the range of the species are needed. Other types of studies, such as chloroplast DNA analysis, may clarify the relationships of the different populations to each other, and to other members of the genus. Based on morphological analysis alone, one cannot rule out the possibility of polyphyletic origins for the Wyoming tansymustard.

SUMMARY AND MANAGEMENT RECOMMENDATIONS

Descurainia torulosa is now known from five sites in the Absaroka Mountains and two in Sweetwater Co., and remains endemic to Wyoming. All known populations are small to extremely small, and the Wyoming tansymustard does not appear to be thriving. Its limited range, small populations and lack of vigor make it very vulnerable to extinction. However, there remain large areas of unsurveyed potential habitat in the northern Absaroka Mountains, and the status of the species may not be as poor as it now appears.

Two taxonomic questions concerning Descurainia torulosa have arisen in the past: 1) is full species status appropriate? and 2) should the Pine Butte population be considered a separate species? Based on morphological analysis, it is concluded that specific status is valid, and that material from Sweetwater Co. should not be recognized as a separate taxon.

In Sweetwater Co., the Wyoming tansymustard is found at the base of northerly-facing cliffs on sparsely-vegetated sandy soil. Elevations are high for the general area. The requirement for

relatively high elevations and north-facing sites suggests that Descurainia torulosa populations in Sweetwater Co. are relics of cooler times, when the species' distribution was more continuous. However additional systematic studies, such as chloroplast DNA analysis, are needed to establish the relationship of Sweetwater Co. material to populations in the Absaroka Mountains. Based on morphology alone, one cannot rule out the possibility of polyphyletic origins.

Unsurveyed Potential Habitat

In the study area, it is unlikely that additional populations of Descurainia torulosa will be found, unless new populations are established at sites surveyed in 1991. Aerial reconnaissance, truck and foot survey revealed little habitat with the appropriate substrate (sandy soils associated with sandstone cliffs and outcrops) that was as mesic as Pine Butte and Lion Bluffs.

A visit was made to Oregon Buttes in north central Sweetwater Co. on July 24, 1991. Potential tansymustard habitat was surveyed on the north/northwest side of the northern butte, which includes north- and northwest-facing sandstone cliffs. Elevation of the cliff bases is about 8400 feet asl. Many rosettes were found, but only four plants were in flower or early fruit; these were all Descurainia incana. Resurvey is needed later in the season when all plants are identifiable.

Aside from Oregon Buttes, it is difficult to nominate sites with potential Descurainia torulosa habitat in the area between the Sweetwater Co. populations and those in the Absaroka Mountains. There may be potential sites on the east slope of the Wind River Range, where sandstone outcrops are occasionally found at higher elevations. Much of this area remains poorly known botanically.

There are large areas of unsurveyed potential habitat in the Absaroka Mountains. The 1990 study (Marriott 1991) focussed on the Brooks Lake and Togwotee Pass areas and areas of similar habitat in the Buffalo and Wind River Districts of Bridger-Teton and Shoshone National Forests. The best approach to further survey would be to focus on the areas of known and reported sites to the north: Carter Mountain, and the Sweetwater/Clearwater Creeks area off the North Fork of the Shoshone River.

Management Recommendations

The Pine Butte population is relatively inaccessible to humans and livestock. However, debris dumped from the summit above has landed in areas of potential habitat. At Lion Bluffs, the southwest end of the Wyoming tansymustard population is easily accessible from the two-track road that runs northeast along the summit of Quaking Asp Mountain from the large telecommunications facility. However, there is no sign of human disturbance of the population at present. If the road were improved, and human use increased significantly, impact on the tansymustard would be a concern. Natural disturbance (e.g. rockfall) may threaten

populations, but does not appear to be as frequent as in Absaroka tansymustard habitat. Three management actions are recommended for protection of Descurainia torulosa in Sweetwater Co.: 1) special management area designation, 2) monitoring, and 3) Federal special status designation for the species.

Special area designation. Area of Critical Environmental Concern (ACEC) designation is recommended for both Pine Butte and Lion Bluffs. Because Wyoming tansymustard populations are small to very small, and therefore quite vulnerable to extirpation, it is important to protect as many as possible.

"The ACEC designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. In addition designation also serves as a reminder that significant value(s) or resource(s) exist which must be accommodated when future management actions and land use proposals are considered near or within an ACEC" (BLM Manual 1613.02, 1988). Populations of Sensitive plant species are significant resources that must be considered in planning management actions.

To be considered for ACEC designation, an area must meet criteria of "relevance" and "importance" (BLM Manual 1613.11, 1988). The proposed Pine Butte and Lion Bluffs ACECs clearly meet these criteria:

"Relevance"--an area meets the "relevance" criterion if it contains...

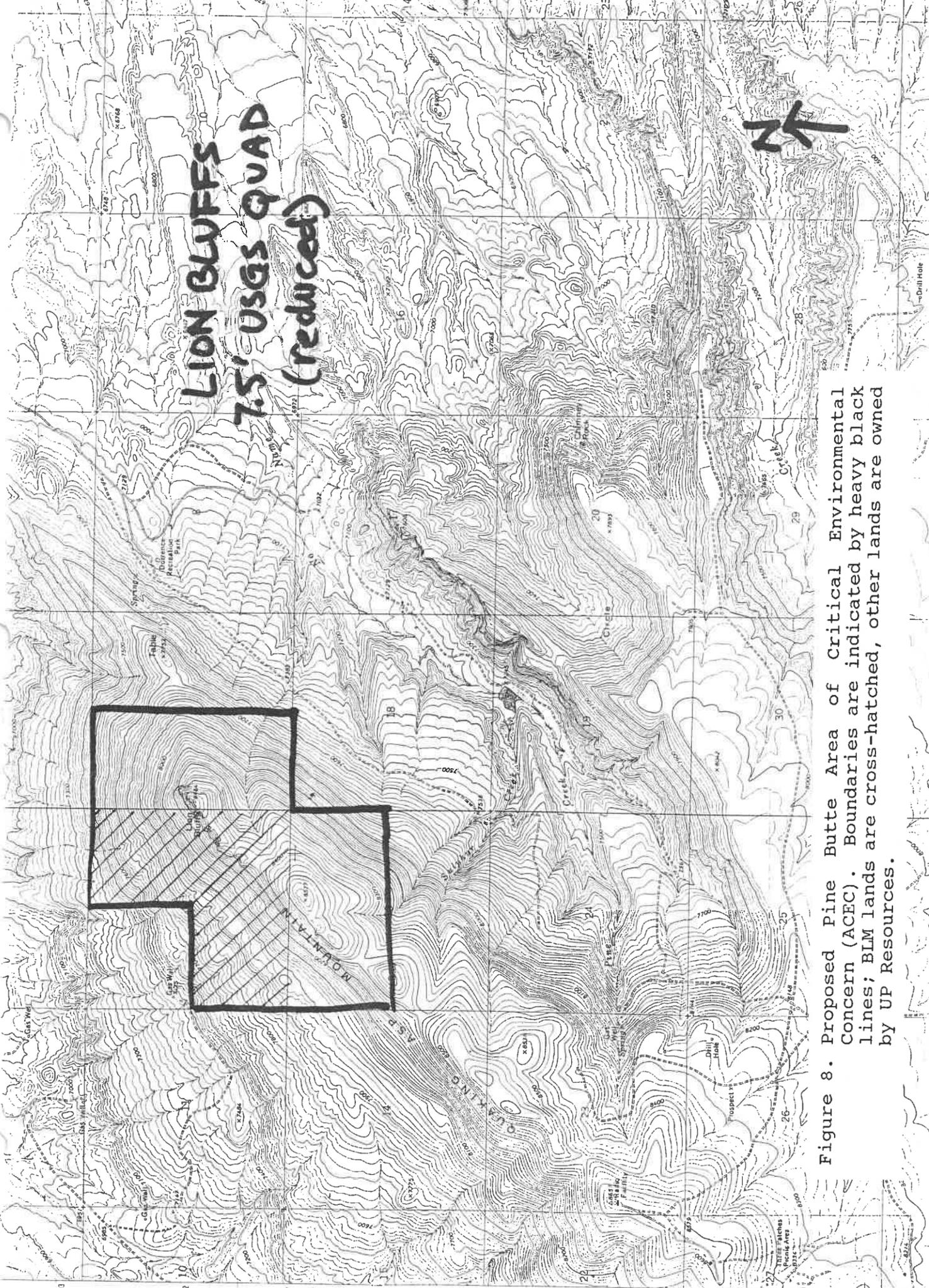
3. A natural process or system (including but not limited to endangered, sensitive or threatened plant species; rare, endemic, or relic plants or plant communities...)

The proposed ACECs contain two of the seven known populations of Descurainia torulosa, a globally rare plant species recognized as sensitive by the BLM. These two populations are widely disjunct from the main range of the species, and may be relics of cooler climatic conditions.

"Importance"--an area meets the "importance" criterion if it...

1. Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern...
2. Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.
3. Has been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of FLPMA...

The proposed ACECs contain the two largest of seven known populations of a globally rare plant; thus the area is significant on more than a local level. The widely disjunct distribution pattern is of interest to phytogeographers, and may give some clue to past climates and floras. The narrow ecological amplitude of Descurainia torulosa makes it of interest to plant ecologists. Because of limited global distribution and small populations, the Wyoming tansymustard is vulnerable to extinction. Existing and



LION BLUFFS
7.5' USGS QUAD
(reduced)

Figure 8. Proposed Pine Butte Area of Critical Environmental Concern (ACEC). Boundaries are indicated by heavy black lines; BLM lands are cross-hatched, other lands are owned by UP Resources.

potential threats include human-generated debris fall, increased recreational use and telecommunications facilities expansion.

The Federal Land Policy and Management Act (FLPMA) directs the BLM to give priority to designation and protection of ACECs in developing land use plans (Sec. 202[c][3]). Designation of Pine Butte and Lion Bluffs ACECs should be evaluated as alternatives in the Green River Resource Management Plan (in preparation).

Recommended boundaries for the proposed ACECs are shown in Figures 7 and 8. These areas include the tansymustard populations surveyed in 1991, as well as preserve buffers. Both of the proposed ACECs are located in a zone of "checkerboard" ownership, also shown in Figures 7 and 8. Private lands belong to Union Pacific Resources and are managed by the Rock Springs Grazing Association. Public lands are managed by the Green River Resource Area of the BLM. It is recommended that the BLM work with the Wyoming Nature Conservancy to acquire private lands within the proposed ACECs.

Management of ACECs is specified at the time of designation, and objectives and special management requirements are tailored to protect the values for which the area was designated. The following management actions should be included:

Pine Butte: All lands within the proposed ACEC should be exempted from additional surface-disturbing activities, including, but not limited to, road construction, oil/gas activities and minerals development; herbicide use should not be allowed; the population should be monitored annually to track population trends (a straight census is recommended); prohibition of debris dumping off the summit should be enforced.

Lion Bluffs: All lands within the proposed ACEC should be exempted from additional surface-disturbing activities, including, but not limited to, road construction, oil/gas activities and minerals development; herbicide use should not be allowed; the population should be monitored annually to track population trends (a straight census is recommended); monitoring should include assessment of human impact--if use increases significantly, road closure should be considered.

Management plans for both ACECs should allow for new guidelines as more information on trends, threats, etc. becomes available.

Monitoring. Even if no ACECs are designated, population monitoring should continue. Complete censuses done annually are recommended. Sites should be evaluated for human impact as well.

Federal status. In 1990, Descurainia torulosa was elevated from Category 2 to Category 1 candidacy for Federal listing as Threatened. Category 1 candidates are those taxa for which there is sufficient information on biological vulnerability and threats to support proposals to list, whereas Category 2 status indicates that additional information is needed. Category 1 status for Descurainia torulosa is inappropriate, because insufficient information is available to make a decision on listing. The taxonomic status of the plant is not clear. Survey in the Absarokas has been limited, and so the distribution and abundance

of the species also is unclear. It has been recommended that the Wyoming tansymustard be reassigned to Category 2 (Marriott 1991).

BLM-sensitive status for the Wyoming tansymustard should be maintained by the Rock Springs District.

In summary, Descurainia torulosa appears to be very vulnerable to extinction due to limited distribution and small population size. Further survey in the Absaroka Mountains may result in a change in the conservation status of the species, but it is unlikely that it will be found to be common. General floristic surveys in the northern, southeastern and southwestern Absarokas have yielded very few collections (Rocky Mountain Herbarium, University of Wyoming). In any case, the Wyoming tansymustard will most likely remain extremely rare and widely disjunct in Sweetwater Co., at least under present climatic conditions.

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